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Lake Tohopekaliga
Osceola County, Florida

(U.S.) National Eutrophication Survey, Corvallis, OR

Prepared for

Corvallis Environmental Research Lab, OR

Dec 77

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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NATIONAL EUTROPHICATION SURVEY

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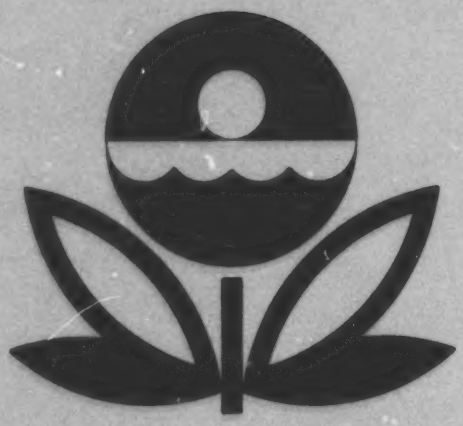

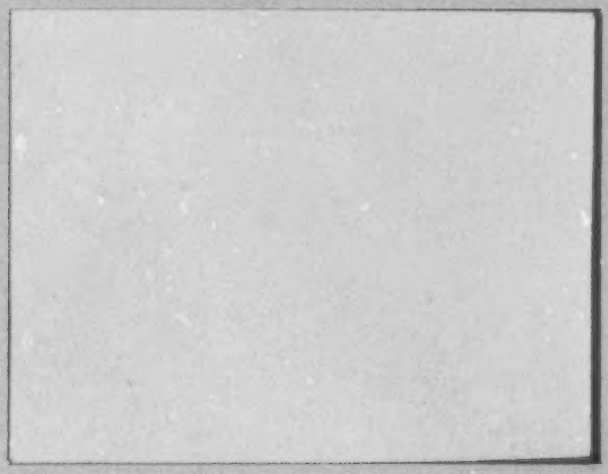

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REPORT

ON

LAKE TOHOPEKALIGA

OSCEOLA COUNTY

FLORIDA

EPA REGION IV

WORKING PAPER NO. 277

WITH THE COOPERATION OF THE

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

AND THE

FLORIDA NATIONAL GUARD

DECEMBER, 1977

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Florida Department of Environmental Regulation for professional involvement and to the Florida National Guard for conducting the tributary sampling phase of the Survey.

Joseph W. Landers, Jr., Secretary of the Department of Environmental Regulation; John A Redmond, former Director of the Division of Planning, Technical Assistance, and Grants; and Dr. Tim S. Stuart, Chief of the Bureau of Water Quality, provided invaluable lake documentation and counsel during the survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

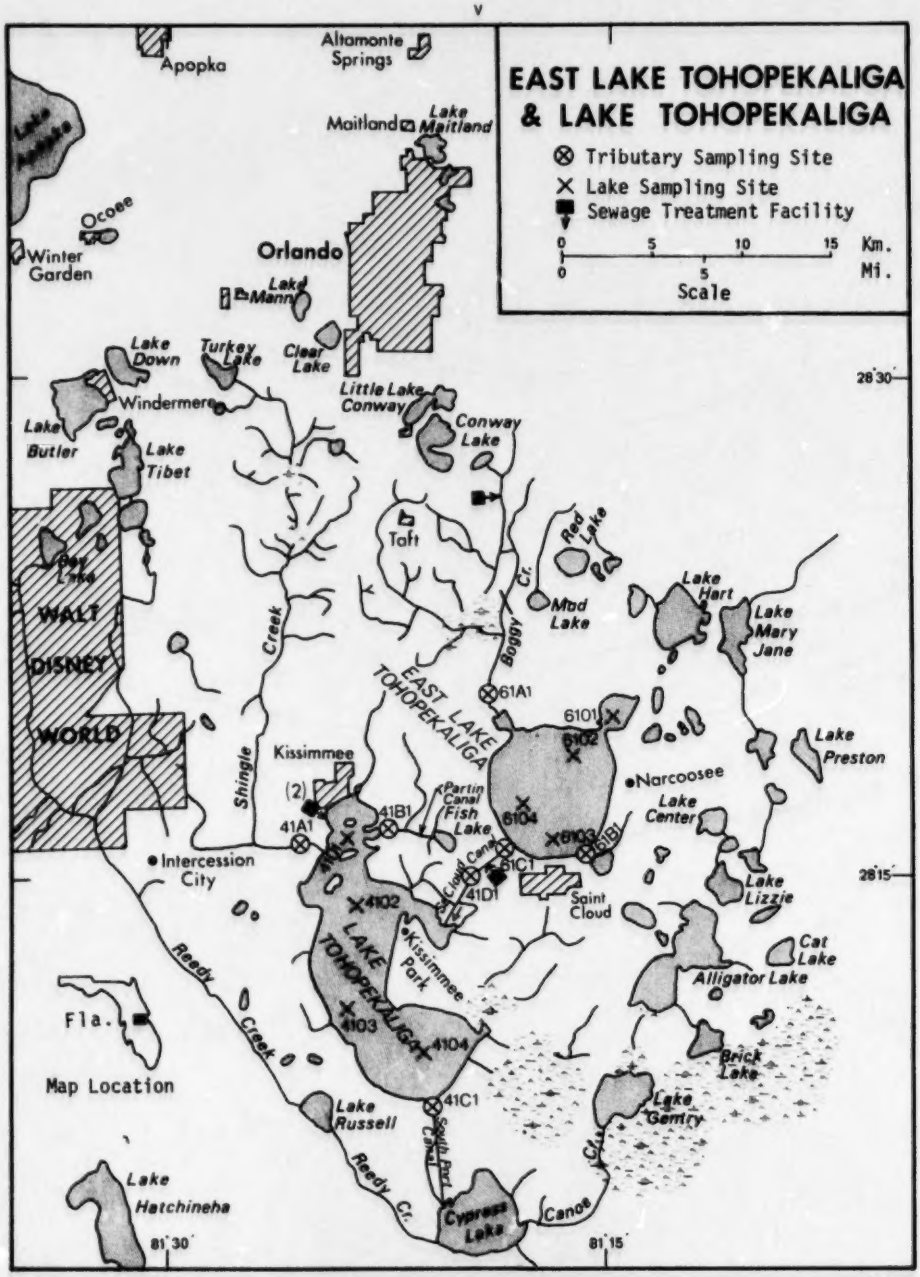
Major General Henry W. McMillan (Retired), then the Adjutant General of Florida, and Project Officer Colonel Hugo F. Windham, who directed the volunteer efforts of the Florida National Guard, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF FLORIDA

LAKE NAME	COUNTY
Alligator	Columbia
Apopka	Lake, Orange
Banana	Polk
Crescent	Flagler, Putnam
Doctors	Clay
Dora	Lake
East Tohopekaliga	Osceola
Effie	Polk
Eloise	Polk
George	Putnam, Volusia
Gibson	Polk
Glenada	Highlands
Griffin	Lake
Haines	Polk
Hancock	Polk
Horseshoe	Seminole
Howell	Orange, Seminole
Istokpoga	Highlands
Jessie	Polk
Jessup	Seminole
Kissimmee	Osceola
Lawne	Orange
Lulu	Polk
Marion	Polk
Minnehaha	Orange
Minneola	Lake
Monroe	Seminole, Volusia
Munson	Leon
Okeechobee	Glades, Hendry, Martin, Okeechobee, Palm Beach
Poinsett	Brevard, Orange, Osceola
Reedy	Polk
Seminole	Jackson, FL; Decatur, Seminole, GA
Seminole	Pinellas
South	Brevard
Talquin	Gadsden, Leon
Tarpon	Pinellas
Thonotosassa	Hillsborough
Tohopekaliga	Osceola
Trout	Lake
Weohyakapka	Polk
Yale	Lake


EAST LAKE TOHOPEKALIGA
& LAKE TOHOPEKALIGA
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
0 5 10 15 Km.
0 5 Mi.
Scale
Apopka
Altamonte Springs
Maitland
Lake Maitland
Lake Apopka
Ocoee
Winter Garden
Orlando
Lake Mann
Lake Down
Turkey Lake
Clear Lake
Little Lake Conway
Conway Lake
Windermere
Lake Butler
Lake Tibet
Bay Lake
WALT DISNEY WORLD
Taft
Red Lake
Mud Lake
Boggy Cr.
Lake Hart
Lake Mary Jane
Lake Preston
Shingle Creek
EAST LAKE TOHOPEKALIGA
61A1
6101
6102
Kissimmee
(2)
41A1
41B1
Partin Canal
Fish Lake
6104
6103
41B1
Narcoosee
Lake Center
Intercession City
41C1
41D1
Saint Cloud
Lake Lizzie
4102
Kissimmee Park
LAKE TOHOPEKALIGA
Cat Lake
Alligator Lake
Reedy Creek
Fla.
Map Location
4103
4104
Brick Lake
Lake Gentry
Lake Russell
41C1
Canoe Cr.
Lake Hatchineha
Cypress Lake
28°30'
28°15'
81°30'
81°15'

LAKE TOHOPEKALIGA

STORET NO. 1241

I. CONCLUSIONS

A. Trophic Condition:

Survey data and a report by others (Ketelle and Uttormark, 1971) indicate that Lake Tohopekaliga is eutrophic. It ranked 28th in overall trophic quality when the 41 Florida water bodies sampled in 1973 were compared using a combination of six lake parameters*. Twenty-seven of the lakes had less median total phosphorus, 28 had less median dissolved phosphorus, 24 had less median inorganic nitrogen, 21 had less mean chlorophyll a, and 25 had greater mean Secchi disc transparency.

Survey limnologists noted that the lake water was humic-colored and observed surface concentrations of algae in March.

B. Rate-Limiting Nutrient:

The algal assay results indicate that Lake Tohopekaliga was nitrogen limited at the times the samples were collected (03/13/73 and 11/07/73). The lake data indicate nitrogen limitation at the other sampling time as well.

C. Nutrient Controllability:

1. Point sources--It is calculated that point sources (including indirect sources) accounted for 52.0% of the total phosphorus load and 51.0% of the total nitrogen load to the lake during the sampling year.

* See Appendix A.

The City of Orlando McLeod Road plant and the Orange County Southwest plant collectively contributed 27.9% of the total phosphorus and 33.2% of the total nitrogen inputs to Lake Tohopekaliga. Shingle Creek, which receives the effluent from these plants, flows through extensive swampy areas where the channel is poorly defined. Although this area may be a nutrient sink part of the year (Federico and Brezonik, 1975), it is assumed that excessive nutrient loads, such as those discharged to the creek, eventually reach Lake Tohopekaliga (McCaffrey, 1976).

The phosphorus loading of 4.89 g/m^2 measured during the sampling year is 11 times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading. Even complete removal of phosphorus at the point sources considered in this report would still leave a loading of 2.34 $g/m^2/yr$ (more than five times the eutrophic loading); and, although the critical level for Florida lakes may be somewhat higher than that suggested by Vollenweider (see page 14) it does not seem likely that the degree of phosphorus reduction attainable by municipal point-source control would result in a shift to phosphorus limitation and a significant improvement in the trophic condition of the lake.

The persistent nitrogen limitation during Survey sampling, resulting from a combination of relatively low inorganic nitrogen concentrations (median = 0.200 mg/l) and rather high orthophosphorus levels (median = 0.152 mg/l), indicates nitrogen control might

reduce the rate of eutrophication of the lake. However, emphasis during the Survey was on the controllability of phosphorus, and a more intensive study of the nitrogen budget of Lake Tohopekaliga is needed to assess the probable effects of point-source nitrogen control.

2. Non-point sources--It is estimated that non-point sources contributed about 48% of the total phosphorus load and 49% of the total nitrogen load reaching Lake Tohopekaliga during the sampling year. The gaged tributaries contributed an estimated 33.3% of the phosphorus and 36.5% of the nitrogen inputs.

Reportedly, dairy wastes, pasture runoff, and urban drainage contribute nutrients to the lake (Ketelle and Uttormark, 1971).

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Morphometry††:

1. Surface area: 76.20 kilometers^2.
2. Mean depth: 2.4 meters.
3. Maximum depth: 4.0 meters.
4. Volume: 182.880 x 10^6 m^3.
5. Mean hydraulic retention time: 172 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Shingle Creek	466.2	2.67
Partin Canal	26.4	0.31
St. Cloud Canal	826.2	6.47
Minor tributaries & immediate drainage -	210.8	2.84
Totals	1,529.6	12.29**

2. Outlet -

South Port Canal	1,605.8***	12.29

C. Precipitation****:

1. Year of sampling: 122.9 centimeters.
2. Mean annual: 134.1 centimeters.

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† Table of metric conversions--Appendix B.
†† Anonymous, 1972.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Sum of inflows adjusted to equal outflow.
*** Includes area of lake.
**** See Working Paper No. 175.

III. WATER QUALITY SUMMARY

Lake Tohopekaliga was sampled three times during 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from four stations on the lake and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first and third visits, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 1.8 meters at stations 1 and 4 and 1.5 meters at stations 2 and 3.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR LAKE TOHOPEKALIGA
STORET CODE 1241

PARAMETER	1ST SAMPLING (3/13/73) 4 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (9/ 6/73) 4 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (11/ 7/73) 4 SITES RANGE	MEAN	MEDIAN
TEMP (C)	24.6 - 29.0	25.7	25.2	28.8 - 29.5	29.1	29.0	22.7 - 23.1	22.9	23.0
DISS OXY (MG/L)	4.5 - 8.5	6.7	6.9	4.6 - 7.8	5.9	5.4	7.2 - 7.2	7.2	7.2
CNDCTVY (MCHOMO)	180. - 220.	190.	180.	162. - 174.	170.	173.	141. - 153.	144.	142.
PH (STAND UNITS)	6.9 - 10.5	8.9	9.0	6.9 - 8.8	7.6	7.0	7.1 - 7.3	7.2	7.2
TOT ALK (MG/L)	21. - 28.	24.	25.	27. - 34.	29.	27.	17. - 20.	19.	19.
TOT P (MG/L)	0.106 - 0.606	0.287	0.262	0.138 - 0.770	0.461	0.472	0.129 - 0.538	0.277	0.238
ORTHO P (MG/L)	0.013 - 0.489	0.173	0.116	0.053 - 0.690	0.377	0.372	0.042 - 0.420	0.186	0.146
NO2+NO3 (MG/L)	0.070 - 0.420	0.135	0.095	0.090 - 0.170	0.120	0.100	0.030 - 0.150	0.064	0.030
AMMONIA (MG/L)	0.080 - 0.210	0.124	0.110	0.080 - 0.120	0.102	0.100	0.040 - 0.070	0.055	0.050
KJEL N (MG/L)	1.200 - 2.600	1.775	1.600	1.600 - 2.900	2.120	2.000	1.300 - 1.700	1.537	1.600
INORG N (MG/L)	0.190 - 0.500	0.259	0.215	0.170 - 0.270	0.222	0.220	0.070 - 0.220	0.119	0.090
TOTAL N (MG/L)	1.270 - 3.020	1.910	1.685	1.770 - 3.000	2.240	2.150	1.360 - 1.750	1.601	1.630
CHLRPYL A (UG/L)	7.9 - 66.9	37.8	38.2	35.9 - 43.1	39.5	39.5	4.6 - 19.6	14.6	17.0
SECCHI (METERS)	0.3 - 0.5	0.4	0.4	0.6 - 0.9	0.8	0.9	0.7 - 0.9	0.9	0.9

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B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
03/13/73	1. Scenedesmus sp.	4,190
	2. Anabaena sp.	1,178
	3. Melosira sp.	829
	4. Microcystis sp.	698
	5. Dactylococcopsis sp.	611
	Other genera	4,803
	Total	12,309
09/06/73	1. Scenedesmus sp.	7,700
	2. Dactylococcopsis sp.	4,466
	3. Flagellates	3,234
	4. Nitzschia sp.	2,002
	5. Melosira sp.	1,540
	Other genera	6,314
	Total	25,256
11/07/73	1. Flagellates	4,747
	2. Scenedesmus sp.	2,181
	3. Microcystis sp.	1,796
	4. Melosira sp.	1,411
	5. Chroococcus sp.	898
	Other genera	6,027
	Total	17,060

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
03/13/73	1	7.9
	2	28.4
	3	66.9
	4	48.1
09/06/73	1	35.9
	2	43.1
	3	38.1
	4	40.9
11/07/73	1	4.6
	2	16.5
	3	17.6
	4	19.6

C. Limiting Nutrient Study:

1. March sample -

a. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.280	0.266	6.1
0.050 P	0.330	0.266	5.9
0.050 P + 1.0 N	0.330	1.266	15.4
1.0 N	0.280	1.266	15.7

b. Filtered and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.273	0.263	4.0
0.050 P	0.323	0.263	3.8
0.050 P + 1.0 N	0.323	1.263	15.4
1.0 N	0.273	1.263	15.0

2. November sample -

a. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.210	0.180	5.7
0.050 P	0.260	0.180	5.2
0.050 P + 1.0 N	0.260	1.180	29.2
1.0 N	0.210	1.180	29.4

b. Filtered and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.200	0.147	3.7
0.050 P	0.250	0.147	3.3
0.050 P + 1.0 N	0.250	1.147	25.7
1.0 N	0.200	1.147	27.7

3. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential primary prodictivity of Lake Tohopekaliga was high at the times the samples were collected. Also, in all assays, the lack of increase in yields when only orthophosphorus was added and the marked increase in yields when nitrogen alone was added indicate the lake was nitrogen limited at those times.

The lake data also indicate nitrogen limitation; the mean inorganic nitrogen/orthophosphorus ratios were less than 2/1 at all sampling stations and times.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Florida National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v). Sampling was begun in March, 1973, and was completed in February, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Florida District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for South Port Canal (C-1), Partin Canal (B-1), and St. Cloud Canal (at East Lake Tohopekaliga outlet station 61 C-1) were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. The St. Cloud Canal phosphorus load measured at station 41 D-1 was about 29 times greater than the load measured at the outlet of East Lake Tohopekaliga, and it is believed sampling station 41 D-1 was too close to the Saint Cloud wastewater treatment plant discharge point to permit adequate mixing of the effluent in the canal at the sampling point.

The nutrient loads attributed to upstream point sources exceeded those measured in Shingle Creek at station A-1, and the background loads for this stream and the unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the nutrient loads, in $kg/km^2/yr$, at station B-1 and multiplying by the Shingle Creek and ZZ areas in km^2.

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* See Working Paper No. 175.

The indirect point-source loads leaving upstream East Lake Tohopekaliga† were calculated by multiplying the nutrient loads leaving that lake (5,025 kg P and 228,820 kg N) by the fractions of the totals of the nutrient loads contributed by the McCoy Air Force Base and the Orlando Jetport during the sampling year (0.139 for P and 0.022 for N). The Saint Cloud Canal loads were adjusted accordingly.

The operators of the Saint Cloud and Kissimmee Highlands wastewater treatment plants provided monthly effluent samples and corresponding flow data. The City of Orlando (McLeod Road Plant), Orange County Southwest, and the City of Kissimmee did not participate; nutrient loads attributed to these sources are those reported by McCaffrey (1976).

A. Waste Sources:

1. Known municipal -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Saint Cloud*	6,000	tr. filter	3,138.4	St. Cloud Canal
Kissimmee Highlands*	662	tr. filter	424.8	Unnamed Canal/ Lake Tohopekaliga
Kissimmee*	12,000	tr. filter	4,542.0**	West Canal/Lake Tohopekaliga
City of Orlando McLeod Rd. Plant***	60,000	contact stab.	28,390.6	Shingle Creek
Orange Co. S.W.***	37,000	P-removal	17,034.4	Shingle Creek

2. Known industrial - None

† Working Paper No. 249.
* Treatment plant questionnaire.
** Estimated at 0.3785 m^3/capita/days; includes pretreated industrial waste.
*** McCaffrey, 1976.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Shingle Creek	113,285	30.4
Partin Canal	6,405	1.7
St. Cloud Canal	4,325	1.2
b. Minor tributaries & immediate drainage (non-point load) -	51,225	13.8
c. Known domestic STP's -		
Saint Cloud	8,040	2.2
Kissimmee Highlands	1,000	0.3
Kissimmee	80,000	21.5
City of Orlando, McLeod Rd. Plant Orange County S.W. }	103,900	27.9
d. Indirect domestic -	700	0.2
e. Septic tanks* -	30	< 0.1
f. Known industrial - None	-	-
g. Direct precipitation** -	3,355	0.9
Total	372,265	100.0

2. Outputs -

Lake outlet - South Port Canal 63,410

Net annual P accumulation - 308,855 kg.

* Estimate based on 100 lakeshore dwellings, see Working Paper No. 175.
** Brezonik and Shannon, 1971.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source		kg N/yr	% of total
a. Tributaries (non-point load) -			
Shingle Creek		351,980	21.6
Partin Canal		19,945	1.2
St. Cloud Canal		223,785	13.7
b. Minor tributaries & immediate drainage (non-point load) -		159,155	9.8
c. Known domestic STP's -			
Saint Cloud		23,850	1.5
Kissimmee Highlands		1,530	< 0.1
Kissimmee		260,000	15.9
City of Orlando, McLeod Rd. Plant Orange County S.W.	}	541,045	33.2
d. Indirect domestic -		5,035	0.3
e. Septic tanks* -		1,065	< 0.1
f. Known industrial - None		-	-
g. Direct precipitation** -		44,195	2.7
Total		1,631,585	100.0

2. Outputs -

Lake outlet - South Port Canal 1,269,745

3. Net annual N accumulation - 361,840 kg.

D. Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Partin Canal	243	755

* Estimate based on 100 lakeshore dwellings, see Working Paper No. 175.
** Brezonik and Shannon, 1971.

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Note, however, that Florida lakes may be able to assimilate phosphorus at a somewhat higher level than that suggested by Vollenweider (Shannon and Brezonik, 1972).

Essentially, Vollenweider's "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	4.89	4.05	21.4	4.7

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Lake Tohopekaliga:	
"Dangerous" (eutrophic loading)	0.44
"Permissible" (oligotrophic loading)	0.22

V. LITERATURE REVIEWED

Anonymous, 1972. Water-level manipulations project--Lake Tohopekaliga drawdown, 1971-72 annual progress report. Fed. Aid in Fish Restor., Dingell-Johnson Proj. No. F-29-1, FL Game & Fresh Water Fish Comm., Tallahassee.

Federico, Anthony C., and Patrick L. Brezonik, 1975. A survey of water quality in the Kissimmee-Okeechobee watershed. FL Dept. of Env. Reg. Techn. Ser. 1 (8).

Ketelle, Martha J., and Paul D. Uttormark, 1971. Problem lakes in the United States. EPA Water Poll. Contr. Res. Ser., Proj. #16010 EHR, Wash., DC.

McCaffrey, Patrick, 1976. Personal communication. (point-source loading to Shingle Creek; STP nutrient loadings). FL Dept. of Env. Reg., Tallahassee.

Shannon, Earl E., and Patrick L. Brezonik, 1972. Relationships between lake trophic state and nitrogen and phosphorus loading rates. Env. Sci. & Techn. 6 (8): 719-725.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1201	ALLIGATOR LAKE	0.620	0.260	474.000	87.733	13.100	0.386
1202	LAKE APOPKA	0.102	0.230	484.176	46.611	8.200	0.019
1203	LAKE BANANA	0.660	0.260	482.667	208.600	3.600	0.293
1206	LAKE CRESCENT	0.065	0.130	473.889	10.211	10.200	0.033
1207	DOCTORS LAKE	0.084	0.120	465.555	27.100	10.600	0.028
1208	LAKE DORA	0.102	0.240	482.889	54.978	7.400	0.022
1209	LAKE EFFIE	1.480	0.410	489.000	261.433	15.000	0.950
1210	LAKE GEORGE	0.129	0.165	469.308	35.000	11.000	0.063
1211	LAKE GIBSON	0.167	0.115	470.000	19.675	10.200	0.069
1212	GLENADA LAKE	0.134	0.165	454.167	27.667	14.700	0.072
1214	LAKE GRIFFIN	0.119	0.260	481.333	66.855	6.600	0.038
1215	LAKE HAINES	0.063	0.115	462.667	26.567	10.600	0.014
1217	LAKE HANCOCK	0.772	0.195	483.500	97.980	5.600	0.158
1219	LAKE HORSESHOE	0.034	0.130	459.000	12.067	11.500	0.023
1220	LAKE HOWELL	1.260	0.285	464.000	54.117	9.000	1.175
1221	LAKE ISTOKPOGA	0.039	0.120	464.222	6.594	8.600	0.010
1223	LAKE JESSUP	0.492	0.290	487.000	76.550	7.600	0.288
1224	LAKE KISSIMMEE	0.034	0.145	463.667	24.142	8.800	0.007
1227	LAKE LULU	1.490	1.065	483.000	276.566	14.300	1.030
1228	LAKE MARION	0.044	0.260	468.833	29.967	7.600	0.016
1229	LAKE MINNEHAHA	0.038	0.080	435.000	8.733	7.700	0.012
1230	LAKE MINNEOLA	0.018	0.070	486.333	3.333	7.400	0.009
1231	LAKE MONROE	0.188	0.300	474.555	14.225	10.800	0.124
1232	LAKE OKEECHOBEE	0.063	0.185	472.366	14.524	9.800	0.010
1234	LAKE POINSETT	0.085	0.150	469.000	6.500	10.600	0.051
1236	LAKE PEEDY	0.033	0.330	468.500	34.837	10.600	0.008
1238	LAKE SOUTH	0.074	0.130	464.000	23.167	9.000	0.026
1239	LAKE TALQUIN	0.085	0.290	462.167	9.483	14.400	0.031

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1240	LAKE THONOTOSASSA	0.695	0.095	466.167	37.700	10.200	0.565
1241	LAKE TOHOPEKALIGA	0.246	0.200	472.917	30.633	10.500	0.152
1242	TROUT LAKE	1.110	0.650	472.000	76.967	12.900	0.970
1243	LAKE WEOHYAKAPKA	0.047	0.080	458.667	7.767	8.200	0.011
1246	LAKE YALE	0.027	0.160	441.000	25.367	7.600	0.014
1247	LAKE MUNSON	1.475	0.925	486.667	140.317	12.200	0.852
1248	LAKE SEMINOLE	0.234	0.175	473.833	102.000	8.600	0.026
1249	LAKE LAWNE	2.560	1.350	494.667	84.900	10.400	0.117
1250	LAKE TARPON	0.041	0.070	488.889	6.867	9.000	0.027
1252	LAKE ELOISE	0.486	0.170	465.333	70.233	12.200	0.339
1258	LAKE JESSIE	0.051	0.090	452.667	26.300	10.800	0.011
1261	EAST LAKE TOHOPEKALIGA	0.042	0.070	440.833	5.167	9.400	0.007
1264	PAYNE'S PRAIRIE LAKE (NO	1.260	0.140	476.000	88.200	7.400	1.210

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1201	ALLIGATOR LAKE	25 (10)	29 (10)	38 (12)	18 (7)	10 (4)	18 (7)	130
1202	LAKE APOPKA	50 (20)	38 (15)	10 (4)	38 (15)	74 (29)	70 (28)	280
1203	LAKE BANANA	23 (9)	29 (10)	20 (8)	5 (2)	100 (40)	23 (9)	200
1206	LAKE CRESCENT	65 (26)	70 (27)	33 (13)	80 (32)	48 (18)	50 (20)	346
1207	DOCTORS LAKE	60 (24)	76 (30)	60 (24)	55 (22)	34 (12)	56 (22)	341
1208	LAKE DORA	53 (21)	35 (14)	18 (7)	33 (13)	90 (35)	68 (27)	297
1209	LAKE EFFIE	5 (2)	10 (4)	3 (1)	3 (1)	0 (0)	10 (4)	31
1210	LAKE GEORGE	45 (18)	54 (21)	48 (19)	43 (17)	23 (9)	43 (17)	256
1211	LAKE GIBSON	40 (16)	81 (32)	45 (18)	70 (28)	48 (18)	40 (16)	324
1212	GLENADA LAKE	43 (17)	54 (21)	85 (34)	53 (21)	3 (1)	38 (15)	276
1214	LAKE GRIFFIN	48 (19)	29 (10)	23 (9)	30 (12)	95 (38)	48 (19)	273
1215	LAKE HAINES	70 (28)	81 (32)	75 (30)	58 (23)	34 (12)	78 (31)	396
1217	LAKE HANCOCK	18 (7)	43 (17)	13 (5)	13 (5)	98 (39)	28 (11)	213
1219	LAKE HORSESHOE	93 (37)	70 (27)	80 (32)	78 (31)	20 (8)	65 (26)	406
1220	LAKE HOWELL	11 (4)	23 (9)	69 (27)	35 (14)	60 (23)	3 (1)	201
1221	LAKE ISTOKPOGA	85 (34)	76 (30)	65 (26)	93 (37)	69 (27)	89 (35)	477
1223	LAKE JESSUP	28 (11)	18 (7)	5 (2)	25 (10)	83 (32)	25 (10)	184
1224	LAKE KISSIMMEE	90 (36)	63 (25)	73 (29)	65 (26)	65 (26)	99 (39)	455
1227	LAKE LULU	3 (1)	3 (1)	15 (6)	0 (0)	8 (3)	5 (2)	34
1228	LAKE MARION	78 (31)	29 (10)	53 (21)	50 (20)	83 (32)	73 (29)	366
1229	LAKE MINNEHAHA	88 (35)	91 (36)	95 (38)	85 (34)	78 (31)	80 (32)	517
1230	LAKE MINNEOLA	100 (40)	98 (38)	98 (39)	100 (40)	90 (35)	93 (37)	579
1231	LAKE MONROE	38 (15)	15 (6)	28 (11)	75 (30)	26 (10)	33 (13)	215
1232	LAKE OKEECHOBEE	68 (27)	45 (18)	40 (16)	73 (29)	53 (21)	89 (35)	368
1234	LAKE POINSETT	58 (23)	60 (24)	50 (20)	95 (38)	34 (12)	45 (18)	342
1236	LAKE WEEDY	95 (38)	13 (5)	55 (22)	45 (18)	34 (12)	95 (38)	337
1238	LAKE SOUTH	63 (25)	70 (27)	69 (27)	68 (27)	60 (23)	56 (22)	386
1239	LAKE TALQUIN	55 (22)	20 (8)	78 (31)	83 (33)	5 (2)	53 (21)	294

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLOWA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1240	LAKE THONOTOSASSA	20 (8)	85 (34)	58 (23)	40 (16)	48 (18)	15 (6)	266
1241	LAKE TOHOPEKALIGA	33 (13)	40 (16)	38 (15)	48 (19)	48 (16)	30 (12)	229
1242	TROUT LAKE	15 (6)	8 (3)	43 (17)	23 (9)	13 (5)	8 (3)	110
1243	LAKE WEOHYAKAPKA	75 (30)	91 (36)	83 (33)	88 (35)	74 (29)	84 (33)	495
1246	LAKE YALE	98 (39)	58 (23)	90 (36)	63 (25)	83 (32)	75 (30)	467
1247	LAKE MUNSON	8 (3)	5 (2)	8 (3)	8 (3)	16 (6)	13 (5)	58
1248	LAKE SEMINOLE	35 (14)	48 (19)	35 (14)	10 (4)	69 (27)	63 (25)	260
1249	LAKE LAVNE	0 (0)	0 (0)	0 (0)	20 (8)	43 (17)	35 (14)	98
1250	LAKE TARPON	83 (33)	98 (38)	100 (40)	90 (36)	60 (23)	60 (24)	491
1252	LAKE ELOISE	30 (12)	50 (20)	63 (25)	28 (11)	16 (6)	20 (8)	207
1258	LAKE JESSIE	73 (29)	88 (35)	88 (35)	60 (24)	26 (10)	84 (33)	419
1261	EAST LAKE TOHOPEKALIGA	80 (32)	98 (38)	93 (37)	98 (39)	55 (22)	99 (39)	523
1264	PAYNE'S PRAIRIE LAKE (NO	11 (4)	65 (26)	25 (10)	15 (6)	98 (35)	0 (0)	206

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	1230	LAKE MINNEOLA	579
2	1261	EAST LAKE TOHOPEKALIGA	523
3	1229	LAKE MINNEHAHA	517
4	1243	LAKE WEOHYAKAPKA	495
5	1250	LAKE TARPON	491
6	1221	LAKE ISTOKPOGA	477
7	1246	LAKE YALE	467
8	1224	LAKE KISSIMMEE	455
9	1258	LAKE JESSIE	419
10	1219	LAKE HORSESHOE	406
11	1215	LAKE HAINES	396
12	1238	LAKE SOUTH	386
13	1232	LAKE OKEECHOBEE	368
14	1228	LAKE MARION	366
15	1206	LAKE CRESCENT	346
16	1234	LAKE POINSETT	342
17	1207	DOCTORS LAKE	341
18	1236	LAKE REEDY	337
19	1211	LAKE GIBSON	324
20	1208	LAKE DORA	297
21	1239	LAKE TALQUIN	294
22	1202	LAKE APOPKA	280
23	1212	GLENADA LAKE	276
24	1214	LAKE GRIFFIN	273
25	1240	LAKE THONOTOSASSA	266
26	1248	LAKE SEMINOLE	260
27	1210	LAKE GEORGE	256
28	1241	LAKE TOHOPEKALIGA	229

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
29	1231	LAKE MONROE	215
30	1217	LAKE HANCOCK	213
31	1252	LAKE ELOISE	207
32	1264	PAYNE'S PRAIRIE LAKE (NO	206
33	1220	LAKE HOWELL	201
34	1203	LAKE BANANA	200
35	1223	LAKE JESSUP	184
36	1201	ALLIGATOR LAKE	130
37	1242	TROUT LAKE	110
38	1249	LAKE LAWNE	98
39	1247	LAKE MUNSON	58
40	1227	LAKE LULU	34
41	1209	LAKE EFFIE	31

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 - cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR FLORIDA 8/25/75

LAKE CODE 1241 LAKE TOHOPEKALIGA

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 1605.8

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1241A1	466.2	1.84	2.63	4.87	1.13	0.28	1.16	3.62	4.11	5.92	3.99	1.70	0.71	2.67
124181	26.4	0.22	0.31	0.57	0.13	0.03	0.14	0.42	0.48	0.69	0.47	0.20	0.08	0.31
1241C1	1605.8	9.57	11.81	15.69	14.89	8.92	8.35	13.68	19.00	15.55	15.35	9.06	5.55	12.29
1241D1	826.2	4.96	5.92	7.96	7.31	4.56	4.67	7.11	9.26	7.19	8.95	5.72	3.99	6.47
1241ZZ	209.8	1.84	2.32	3.54	2.27	1.27	1.59	2.94	3.65	3.62	3.54	2.01	1.27	2.49

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 1605.8
SUM OF SUB-DRAINAGE AREAS = 1528.6

TOTAL FLOW IN = 143.18
TOTAL FLOW OUT = 147.42

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1241A1	3	73	2.07	17	1.64				
	4	73	2.12	7	2.41	13	2.12	16	2.29
	5	73	0.99	13	0.93	18	0.76	27	0.76
	6	73	1.39	16	1.02	17	0.85		
	7	73	3.62	7	7.96	14	3.62		
	8	73	7.62	5	7.90	17	5.21		
	9	73	11.41	8	11.21	16	10.96		
	10	73	5.95	12	3.57				
	11	73	1.78	3	3.57	16	2.24		
	12	73	1.53	8	1.56	13	1.33	15	1.42
	1	74	1.64	12	1.78	18	1.59		
	2	74	1.44	17	1.53	18	1.42		
124181	3	73	0.05	17	0.03				
	4	73	0.05	7	0.06	13	0.07	16	0.04
	5	73	0.01	13	0.01	18	0.01	27	0.03
	6	73	0.04	16	0.03	17	0.03		
	7	73	0.12	7	0.18	14	0.16		
	8	73	0.19	5	0.25	17	0.11		
	9	73	0.45	8	0.45	16	0.48		
	10	73	0.18	12	0.14				
	11	73	0.05	3	0.08	16	0.03		
	12	73	0.02	8	0.03	13	0.03	15	0.03
	1	74	0.01	12	0.03	18	0.03		
	2	74	0.01	17	0.03	18	0.03		

TRIBUTARY FLOW INFORMATION FOR FLORIDA 8/25/75

LAKE CODE 1241 LAKE TOHOPEKALIGA

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1241C1	3	73	14.36	17	25.12				
	4	73	17.44	7	22.85	13	23.19	16	23.53
	5	73	12.23	13	25.85	18	29.73	27	0.0
	6	73	0.0	16	0.0	17	0.0		
	7	73	0.76	7	0.0	14	0.0		
	8	73	12.12	5	28.60	17	9.66		
	9	73	16.28	8	11.89	16	17.81		
	10	73	4.33	12	0.0				
	11	73	0.0	3	0.0	16	0.0		
	12	73	0.0	8	0.0	13	0.0	15	0.0
	1	74	0.0	12	0.0	18	0.0		
	2	74	0.0	17	0.0	18	0.0		
1241D1	3	73	7.70	17	13.73				
	4	73	5.83	7	8.66	13	8.75	16	8.69
	5	73	5.80	13	10.96	18	10.85	27	0.06
	6	73	0.06	16	0.06	17	0.06		
	7	73	0.76	7	0.31	14	0.28		
	8	73	3.62	5	5.78	17	3.57		
	9	73	8.16	8	9.63	16	12.80		
	10	73	5.44	12	0.25				
	11	73	0.06	3	0.08	16	0.03		
	12	73	0.03	8	0.03	13	0.03	15	0.03
	1	74	0.03	12	0.03	18	0.03		
	2	74	0.0	17	0.03	18	0.03		
1241Z2	3	73	0.40	17	0.25				
	4	73	0.40	7	0.45	13	0.51	16	0.34
	5	73	0.12	13	0.11	18	0.06	27	0.25
	6	73	0.34	16	0.25	17	0.20		
	7	73	0.99	7	1.47	14	1.25		
	8	73	1.53	5	1.98	17	0.85		
	9	73	3.54	8	3.51	16	3.88		
	10	73	1.42	12	1.13				
	11	73	0.37	3	0.40	16	0.11		
	12	73	0.18	8	0.17	13	0.11	15	0.17
	1	74	0.12	12	0.11	18	0.08		
	2	74	0.08	17	0.08	18	0.06		

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/08/25

124101
28 16 08.0 081 24 00.0
LAKE TOHOPEKALIGA
12097 FLORIDA

11EPALES
3

2111202
0010 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/13	13 25	0000	25.9		12	180	7.60	24	0.150	1.700	0.070	0.361
	13 25	0006	24.7	4.5		180	6.90	28	0.210	1.200	0.080	0.489
73/09/06	14 20	0000	28.9	5.2	24	173	7.00	27	0.110	2.000	0.150	0.690
	14 20	0005	28.8	4.6		173	6.90	34	0.100	1.600	0.170	0.650
73/11/07	09 15	0000	22.8		28	153	7.20	20	0.070	1.500	0.150	0.420
	09 15	0006	22.7			150	7.10	20	0.070	1.600	0.150	0.321

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/13	13 25	0000	0.448	7.9
	13 25	0006	0.600	
73/09/06	14 20	0000	0.770	35.9
	14 20	0005	0.700	
73/11/07	09 15	0000	0.538	4.6
	09 15	0006	0.366	

STORET RETRIEVAL DATE 75/08/25

124102
28 13 57.0 081 23 42.0
LAKE TOHOPEKALIGA
12097 FLORIDA

11EPALES 2111202
3 0009 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/13	14 05	0000	25.6		18	180	10.40	21	0.080	2.600	0.420	0.201
	14 05	0005	25.1	6.9		200	7.70	23	0.140	1.200	0.070	0.255
73/09/06	14 00	0000	29.4	5.4	36	162	7.00	27	0.080	1.900	0.090	0.372
73/11/07	09 30	0000	23.1		34	141	7.30	17	0.040	1.600	0.030	0.152
	09 30	0005	23.0	7.2		141	7.20	18	0.040	1.600	0.030	0.152

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/13	14 05	0000	0.376	28.4
	14 05	0005	0.346	
73/09/06	14 00	0000	0.472	43.1
73/11/07	09 30	0000	0.230	16.5
	09 30	0005	0.246	

STORET RETRIEVAL DATE 75/08/25

124103
28 11 01.0 081 23 37.0
LAKE TOHOPEKALIGA
12097 FLORIDA

11EPALES
3

2111202
0008 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/13	15 40	0000	25.4		15	220	10.50	22	0.090	2.500	0.110	0.031
	15 40	0004	25.1	6.9		180	9.10	26	0.100	1.500	0.100	0.021
73/09/06	13 55	0000	29.5	6.4	35	168	8.30	27	0.100	2.200	0.090	0.119
73/11/07	09 40	0000	23.1		36	141	7.30	18	0.050	1.700	0.030	0.130
	09 40	0005	23.0	7.2		141	7.20	19	0.050	1.300	0.060	0.140

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/13	15 40	0000	0.179	66.9
	15 40	0004	0.124	
73/09/06	13 55	0000	0.225	38.1
73/11/07	09 40	0000	0.230	17.6
	09 40	0005	0.247	

STORET RETRIEVAL DATE 75/08/25

124104
28 09 53.0 081 21 25.0
LAKE TOHOPEKALIGA
12097 FLORIDA

11EPALES
3

21112v2
0009 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/13	16	15 0000	29.0		18	200	10.20	25	0.120	2.200	0.140	0.013
	16	15 0005	24.6	8.5		180	8.90	26	0.100	1.300	0.090	0.013
73/09/06	13	35 0000	29.0	7.8	33	174	8.80	28	0.120	2.900	0.100	0.053
73/11/07	10	10 0000	23.1		36	142	7.10	19	0.070	1.600	0.030	0.042
	10	10 0006	22.8	7.2		142	7.10	20	0.050	1.400	0.030	0.129

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/13	16	15 0000	0.115	48.1
	16	15 0005	0.106	
73/09/06	13	35 0000	0.138	40.9
73/11/07	10	10 0000	0.129	19.6
	10	10 0006	0.231	

APPENDIX E

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 75/08/25

1241A1
28 16 00.0 081 26 00.0
SHINGLE CREEK
12057 7.5 KISSIMMEE
T/LAKE TOHOPEKALIGA
US HWY 17 BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/17	11 33		0.048	1.540	0.066	0.920	0.960
73/04/13	14 20		0.029	1.890	0.095	0.018	0.030
73/04/27	16 30		0.038	3.500	0.110	1.000	1.050
73/05/18	14 15		0.022	3.780	0.273	1.040	1.150
73/06/16			0.061	5.700	0.750	2.500	2.500
73/07/14	11 00		0.084	1.700	0.097	1.100	1.200
73/08/17	16 35		0.066	2.400	0.120	1.040	1.100
73/09/08	12 30		0.048	3.100	0.075	0.805	0.890
73/09/16	09 45		0.050	1.260	0.058	0.701	0.701
73/10/12	15 30		0.052	1.250	0.036	0.520	0.575
73/11/03	15 40		0.216	1.550	0.064	0.540	0.590
73/12/13	12 30		0.168	0.900	0.064	1.060	1.100
74/01/12	10 30		0.016	2.200	0.040	0.264	0.400
74/01/18	10 00		0.288	1.900	0.160	1.300	1.450
74/02/17	08 30		0.504	1.500	0.055	1.500	1.760

STORET RETRIEVAL DATE 75/08/25

124181
28 17 00.0 081 23 00.0
PARTIN CANAL
12 7.5 KISSIMMEE
T/LAKE TOHOPEKALIGA
AT LIGHT DUTY RD BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/17	10 40		0.029	4.050	0.176	0.200	0.270
73/04/07	11 00		0.011	1.150	0.033	0.061	0.105
73/05/13	09 30		0.010K	1.150	0.030	0.180	0.305
73/06/17	10 00		0.014	2.200	0.115	0.480	0.700
73/07/07	11 50		0.012	2.200	0.067	0.350	0.750
73/08/05	09 30		0.020	10.500	1.160	0.935	1.850
73/09/08	12 40		0.014	2.615	0.115	0.460	0.550
73/10/12	15 00		0.010K	1.550	0.057	0.010	0.230
73/11/03	11 00		0.076	1.350	0.040	0.168	0.220
73/12/08	10 50		0.016	2.000	0.076	0.156	0.195
73/12/15	13 30		0.084	0.900	0.058	0.790	0.890
74/01/12	11 00		0.184	1.300	0.028	1.350	1.500
74/02/17	11 20		0.036	2.300	0.125	0.375	0.570

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/08/25

1241C1
28 08 30.0 081 21 00.0
S PORT CANAL
12 7.5 S ST CLOUD
T/LAKE TOHOPEKALIGA
RD BRDG NEAR GAGING STATION
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/17	12 05		0.016	6.000	0.094	0.034	0.240
73/04/16	14 15		0.019	5.000	0.220	0.026	0.165
73/05/18	14 30		0.022	2.900	0.084	0.021	0.185
73/06/16			0.021	3.900	0.052	0.042	0.240
73/07/14	10 20		0.031	3.150	0.078	0.012	0.130
73/08/17	16 15		0.010K	2.800	0.046	0.021	0.160
73/09/16	10 05		0.010K	1.400	0.024	0.009	0.118
73/10/12	15 00		0.063	1.250	0.037	0.057	0.135
73/11/16	13 30		0.024	2.900	0.120	0.028	0.115
73/12/13	12 00		0.088	5.200	0.216	0.044	0.115
74/01/18	10 40		0.060	1.400	0.060	0.035	0.110
74/02/17	10 00		0.028	1.700	0.035	0.035	0.120

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/08/25

124101
28 15 00.0 081 20 00.0
ST CLOUD CANAL
12 7.5 N ST CLOUD
O/LAKE TOHOPEKALIGA
300 YDS ABOVE FLORIDA TURNPIKE BRDG 62
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/17	10 15		0.027		0.080	0.028	0.070
73/04/07	12 30		0.040	1.680	0.078	0.025	0.060
73/05/13	10 00		0.031	0.750	0.040	0.033	0.050
73/06/17	10 15		0.700	1.680	0.017	1.040	1.250
73/07/07	11 00		0.470	1.980	0.110	2.300	2.500
73/08/05	10 00		0.010K	0.580	0.039	0.035	0.060
73/12/08	09 45		0.232	2.000	1.010	1.400	1.600
73/12/15	14 00		0.010K	1.100	0.040	0.016	0.057
74/01/12	11 15		0.012	0.950	0.028	0.030	0.085
74/02/17	11 35		0.012	1.300	0.030	0.020	0.070

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/08/25

1241DA TF1241DA P006000
28 15 30.0 081 18 30.0
ST CLOUD
12057 7.5 ST CLOUD N
T/LAKE TOHOPEKALIGA
ST CLOUD CANAL
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/02/07 CP(T)- 73/02/07	07 00 19 00		6.500	14.000	6.300	4.200	6.000	1.140	1.070
73/03/14 CP(T)- 73/03/14	07 00 19 00		6.800	16.400	9.200	6.700	7.700	1.000	0.940
73/04/18 CP(T)- 73/04/18	07 00 19 00		6.800	14.000	6.400	6.700	7.700	0.700	0.700
73/05/23 CP(T)- 73/05/23	07 00 19 00		9.500	12.000	4.200	6.800	7.650	0.730	0.710
73/06/19 CP(T)- 73/06/19	07 00 19 00		14.400	9.600	4.800	7.400	8.300	0.690	0.680
73/07/18 CP(T)- 73/07/18	07 00 19 00		1.680	23.500	9.150	7.450	7.900	0.630	0.640
73/08/22 CP(T)- 73/08/22	07 00 19 00		6.600	10.500	3.920	7.100	7.800	0.730	0.700
73/09/26 CP(T)- 73/09/26	07 00 19 00		3.900	10.500	2.520	4.500	4.950	1.730	1.010
73/10/31 CP(T)- 73/10/31	07 00 19 00		9.000	11.000	4.400	5.700	6.600	0.950	1.120
73/12/12 CP(T)- 73/12/12	07 00 19 00		9.800	12.000	3.950	6.400	6.800	0.800	0.810
74/01/16 CP(T)- 74/01/16	07 00 19 00		7.100	22.000	7.800	7.800	9.200	0.760	0.740

STORET RETRIEVAL DATE 75/08/25

1241EA TF1241EA P000662
28 17 00.0 081 24 30.0
KISSIMMEE
12 7.5 KISSIMMEE
D/LAKE TOHOPEKALIGA
LAKE TOHOPEKALIGA
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/02/15	14	00	0.030	6.900	2.500	4.600	6.400	0.100	0.100
73/03/08			0.040	10.500	4.950	5.900	6.500	0.100	0.100
73/04/16			0.010K	9.500	2.600	5.600	5.800	0.101	0.095
73/05/10	09	00	0.015	11.500	3.000	6.100	6.800	0.200	0.100
73/06/04			0.144	11.800	4.970	6.460	7.000	0.105	0.105
73/07/02	15	00	0.010K	8.400	2.200		6.100	0.115	0.115
73/08/07	10	00	0.260	8.300	0.600	1.680	9.800	0.113	0.110
73/09/06	12	00	0.024	7.100	0.800	3.380	3.950	0.135	0.133
73/10/05	09	00	0.040	6.600	0.460	3.500	3.900	0.150	0.150
73/11/07	14	30	0.070	12.000	4.500	5.300	6.500	0.110	0.143
73/12/07	13	15	0.170	13.000	4.800	6.200	7.000	0.075	0.108
74/01/09	11	30	0.160	9.100	3.520	6.300	7.350	0.100	0.100
74/02/06			0.120	14.000	5.100	7.350	8.300	0.100	0.100

K VALUE KNOWN TO BE
LESS THAN INDICATED